Kristin Alexander

From: John McGovern [John.McGovern@Sun.COM]
Sent: Friday, March 04, 2005 3:51 PM
To: Lauren Rosenzweig
Cc: Planning Board
Subject: Antenna comments in advance of 08 Mar meeting.


PL103_408.doc (17 KB)


04Marc05 omment.pdf (88 KB

Thanks for the additional opportunity to comment.
I make some new comments, with additional references
for the board which are attached.
john

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John McGovern, Corp. Customs Manager
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To: Acton Planning Board
Fm: John McGovern, Acton
Re: Antenna Zoning Info
Dt: 04 March 05

Dear Ms. Rosenweig:

Thank you for keeping open the comment process on the antenna zoning issues for amateur radio operators in Acton. This is beneficial, as I think we are all more efficient at developing the pertinent facts, and concerns. I have no doubt these can be satisfactorily addressed. I offer these additional comments in advance of the 08 March 05 Planning Board meeting in the event I may be out of town that night to run AAU basketball tryouts.

- There were a few open items in my mind from the last meeting. Roland Bartl had some questions about remote amateur radio stations not attached to structures. I include an article for him which explains "remote station" operation. A diagrammatic visual summary is near the end of that article. In short, there is no habitable structure requirements for this antenna and tower to work. It is not very common yet, but offers an alternative for some amateurs. Experimentation is a fundamental part of this amateur radio art and discipline.

- Near the end of the last meeting one Planning Board member read from a section of the 1999 update[1] to the 1985 PRB-1 ruling, and the language that stuck in my mind was this:

    - "...Given this express Commission language, it is clear that a "balancing of interests" approach is not appropriate in this context...."

    In effect, the FCC has already balanced the interest of the federal government with the local government , and further re-balancing is inappropriate.

- This 1999 PRB-1 update incorporates PL103-408 signed by Pres. Clinton on October 27, 1994. I attach it in entirety since it was not previously supplied to the Planning Board. The language I want to point out is in the last paragraph.

    - "...(3) reasonable accommodation should be made for the effective operation of amateur radio from residences, private vehicles and public areas, and that regulation at all levels of government should facilitate and encourage amateur radio operation as a public benefit[2].

    The PL103-408 language effectively burdens the town with an additional question or requirement in this area of strong federal interest : *In what way will the By-Law changes "facilitate and encourage amateur radio operation as a public benefit" in Acton?*

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1 http://wireless.fcc.gov/services/amateur/prb/prb1999.html
2 **PL 103-408**, October 22, 1994, 108 Stat 4228

Lastly, I'd like to point out some other issues.

- "Reasonable accommodation" language in MGL Ch 40A obliges us to follow reason.

  I've seen no developed reason to support the proposed Bylaw constraints on limitation of towers to only one(1) , or requirement for attachment to a habitable structure. I find it unsupported by reason that a Bylaw limitation expected to protect public safety **requires** attachment within a possible limited collapse zone to a habitable structure. This is a decision better left to the individual amateur's judgment

- As I understand, the board of selectmen preferred the prior draft the planning board rejected, my prior comments still stand on that draft. I think the existing Bylaw "customary installation" language is more PRB-1/MGL Ch40A compliant than the previously rejected proposal. However , I make one new supportive comment.

  - The additional Acton Zoning Appeal process is probably sufficient to meet the "negotiation" requirement of the Chedester Vs Whately decision. Taken together with an 80 foot initial limit, this requirement is probably MGL CH 40A, PRB-1 compliant. I would like some info on this zoning appeal process, as the appeal process cannot be costly, or delayed lest it become non PRB-1 conforming.

  - Prior Proposed 3.8.3.6(b) proposed 60 day limit on tower removal is too short, weather conditions (winter snow, spring mud) may prevent safe or economical dismantling by a (new) LOT owner who may be a surviving elderly familiy member with limited resources. 1 year is a more reasonable period for removal.

  - It is permissible to use a trust for home ownership in Acton, since a trust is not an FCC licensed operator, the regulatory effect of this section on different types of LOT ownership needs to be clarified.

- I have only briefly reviewed the Concord, and Harvard Bylaws on this topic, but find they may represent a better expression of the minimum practicable regulation than the prior Acton proposal.

I hope these comments are read in the constructive light they are intended.

Regards

John P. McGovern

UNITED STATES PUBLIC LAWS
103rd Congress - Second Session
Convening January 25, 1994

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Additions and Deletions are not identified in this document.

PL 103-408 (SJRes 90)
October 22, 1994
ACHIEVEMENTS OF RADIO AMATEURS

Joint Resolution to recognize the achievements of radio amateurs, and to establish support for such amateurs as national policy.

Whereas Congress has expressed its determination in section 1 of the Communications Act of 1934 (47 U.S.C. 151) to promote safety of life and property through the use of radio communication;

Whereas Congress, in section 7 of the Communications Act of 1934 (47 U.S.C. 157), established a policy to encourage the provision of new technologies and services;

Whereas Congress, in section 3 of the Communications Act of 1934, defined radio stations to include amateur stations operated by persons interested in radio technique without pecuniary interest;

Whereas the Federal Communications Commission has created an effective regulatory framework through which the amateur radio service has been able to achieve the goals of the service;

Whereas these regulations, set forth in part 97 of title 47 of the Code of Federal Regulations clarify and extend the purposes of the amateur radio service as a--

(1) voluntary noncommercial communication service, particularly with respect to providing emergency communications;

(2) contributing service to the advancement of the telecommunications infrastructure;

(3) service which encourages improvement of an individual's technical and operating skills;

(4) service providing a national reservoir of trained operators, technicians and electronics experts; and

(5) service enhancing international good will;

Whereas Congress finds that members of the amateur radio service community has provided invaluable emergency communications services following such disasters as Hurricanes Hugo, Andrew, and Iniki, the Mt. St. Helens eruption, the Loma Prieta earthquake, tornadoes, floods, wild fires, and industrial accidents in great number and variety across the Nation; and

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Whereas Congress finds that the amateur radio service has made a contribution to our Nation's communications by its crafting, in 1961, of the first Earth satellite licensed by the Federal Communications Commission, by its proof-of-concept for search and rescue satellites, by its continued exploration of the low Earth orbit in particular pointing the way to commercial use thereof in the 1990s, by its pioneering of communications using reflections from meteor trails, a technique now used for certain government and commercial communications, and by its leading role in development of low-cost, practical data transmission by radio which increasingly is being put to extensive use in, for instance, the land mobile service: Now, therefore, be it

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. FINDINGS AND DECLARATIONS OF CONGRESS.

Congress finds and declares that--

(1) radio amateurs are hereby commended for their contributions to technical progress in electronics, and for their emergency radio communications in times of disaster;

(2) the Federal Communications Commission is urged to continue and enhance the development of the amateur radio service as a public benefit by adopting rules and regulations which encourage the use of new technologies within the amateur radio service; and

(3) reasonable accommodation should be made for the effective operation of amateur radio from residences, private vehicles and public areas, and that regulation at all levels of government should facilitate and encourage amateur radio operation as a public benefit.

Approved October 22, 1994.

PL 103-408, 1994 SJRes 90

END OF DOCUMENT

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Remote Operation Comes Home

Personal computers combine with today's sophisticated HF transceivers to make remotely controlled stations more feasible than ever.

By Patty Winter, N6BIS

Antenna restrictions. RFI problems. Land prices that make large lots prohibitively expensive. Sometimes it's a wonder that we still manage to get on the air and enjoy Amateur Radio at all!

What's the solution when you can't set up an effective amateur station at *your* home?

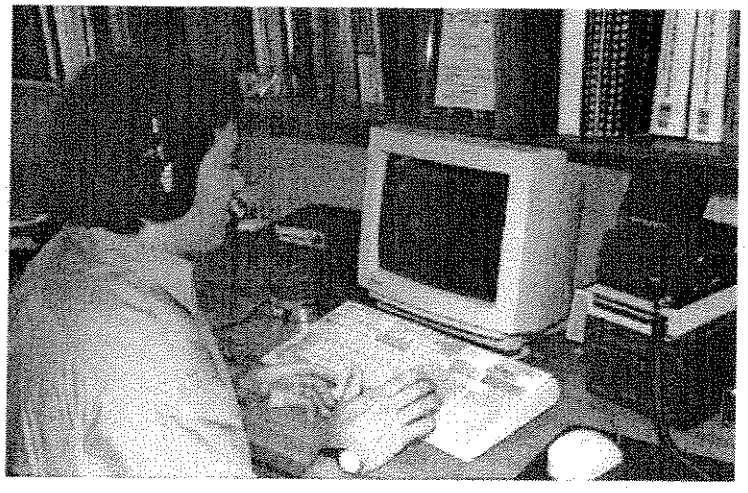
One idea that has occurred to hams many times over the years is, "What if I could put a station somewhere out away from town and operate it from my house?" You'd have easy access to the large antennas and amplifiers that could provide reliable communication—day in and day out—for contesting, DXing, and ragchewing.

Unfortunately, such a setup has thus far been either too expensive, too primitive, or both. But as more computer-controllable transceivers and other station components come on the market; as a broader variety of software becomes available to run them; and as more powerful data-communication equipment (including high-speed modems and Integrated Services Digital Network [ISDN] telephone lines) reaches the home, the dream that was once pie in the sky—that of a remotely controlled Amateur Radio station—is becoming a realistic solution for many hams.

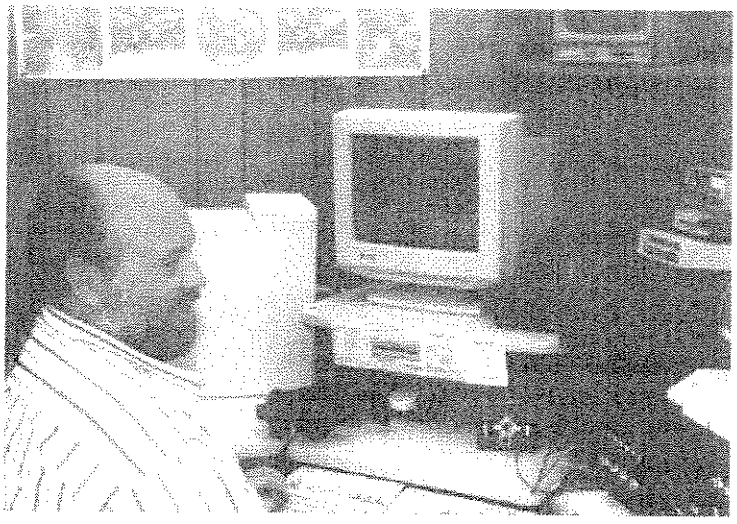
If you don't already own a computer-controllable transceiver, you'll have to upgrade to one. If you already own one, all you'll need is a computer at each end of the link, the appropriate software (and perhaps interface hardware) to control the radio and other station components, and two telephone lines. (There will be a discussion later of how phone lines and general-purpose computers are preferable to radio links and tone-based control units.) In its simplest incarnation, a remotely controlled station would use a multiband vertical antenna; a more sophisticated setup would incorporate one or more beam antennas. An amplifier is also optional.

A project like this could be perfect for Amateur Radio clubs. Members could pool their time and money to develop a remote station, then share it from their homes. The station could also be operated locally during multi-op contesting efforts.

In this article, we'll take a look at one such station in California, owned by Roger Strauch, KD6UO. Although each remotely controlled Amateur Radio station will have its own unique collection of hardware and software, the items mentioned here are representative of the components currently available.



Roger Strauch, KD6UO, enjoys HF operating via computer remote control from his home in Piedmont, California. The actual station is more than 10 miles away.



The architect and builder of the remote system: Don Melcher, N6IPE.

Project Background

KD6UO, who's been a ham for more than 25 years, is a devoted HFer with a particular interest in contesting and DXing. His home is in Piedmont, east of San Francisco Bay—a lovely town, but with hills that block Roger's view toward Europe and with lot sizes that rule out large antennas.

In April 1993, Roger and communications consultant Don Melcher, N6IPE, began designing a remotely controlled station to be installed in Alameda, about 10 miles from Roger's house. Alameda is an island, so it has a much more open horizon than is possibly in hilly Piedmont. The station, which went on the air in September 1994, is in a light-industrial area in one of Alameda's many marinas. Roger has now worked at least 150 DXCC countries via remote operations.

The entire system was built mostly by N6IPE, with help from a couple of other hams (including Don's dad, Al Melcher, W6YQB) and a contract programmer for one piece of software. Don sometimes uses Roger's station from his own house in near-by Oakland, where his own HF antenna is blocked in several directions by high hills.

A single computer at the Alameda site handles the actual control of the radio, antenna rotor, and other accessories. At his house, KD6UO can view the screen of that computer on his local monitor and send commands to it.

Roger notes that, "The part we're most proud of is how simple it is. We wrote a few lines of custom code; other than that, we integrated off-the-shelf hardware and software. I can point the antenna, change the frequency, and so on all through a single screen. Other than not having a radio in front of you, the fact that the station is remotely controlled is transparent."

Radio and Radio Control

All major manufacturers of Amateur Radio transceivers now offer models that can be controlled by a computer; however, accessory hardware is often required between the computer and the radio. Specific features vary among models and manufacturers, so you'll want to compare them carefully before choosing a rig. For example, some radios offer controllable up/down tuning and RIT, while others don't. If you're selecting a radio that will be used almost exclusively for remote operation, you may want to skip the models that have a lot of fancy front-panel features you won't be using.

There's also an increasing selection of control software available for ham radios. Some transceiver manufacturers sell such software, as do some makers of accessory products. Several small software companies and even individual hams who have computer expertise also offer control software for a variety of today's transceivers.

KD6UO's station (**Figure 1**) uses an ICOM IC-781 HF transceiver (which he already owned before this project was begun) connected to the computer via an ICOM CI-V interface. The radio is controlled by *CT* software from K1EA Software. Roger and Don

found that *CT* met their needs because it offers good all-purpose control (including rotors as well as radios) plus special features for contesting.

For example, *CT* permits the operator to change the radio to the frequency of a station called out on the *PacketCluster* network simply by pressing a couple of keys, a handy feature during hectic contesting. The Alameda station includes a packet system connected to the computer for this purpose. (Roger also has a separate packet system at his house so that he can access *PacketCluster* information without bringing up the remote station. Both packet systems use Alinco DR-1200 data radios.)

The IC-781 has a built-in display on the front panel that can be switched among a number of status screens. Although the display cannot be switched remotely, whichever screen is selected can be sent to a remote monitor via an NTSC video output port. The main screen shows the VFO A and B frequencies, the current mode, and a spectrum analyzer that can quickly show you whether there's any activity on a given band, so it provides a lot of useful information even when you can't access the other screens. KD6UO's system captures this screen and sends it to the computer at his home for viewing.

Attached to the radio and controlled by it is an ICOM IC-4KL amplifier. The radio can switch the amplifier to a different band and retune it. Some other brands of amplifiers can sense a frequency change on the radio and retune themselves, or can be controlled directly by a computer.

Because the IC-781 doesn't permit up/down tuning and transmitter keying through the computer port, a small amount of custom hardware and software was required to control those functions remotely through the radio's microphone connector. Depending on the radio and control software you choose for your remote station, you might be able to accomplish these functions with off-the-shelf products. Now, Roger can turn the IC-781's transmitter on and off by pressing the up and down arrow keys on his home computer, and he can scan up and down the band (in 50-Hz steps) with the left and right arrow keys.

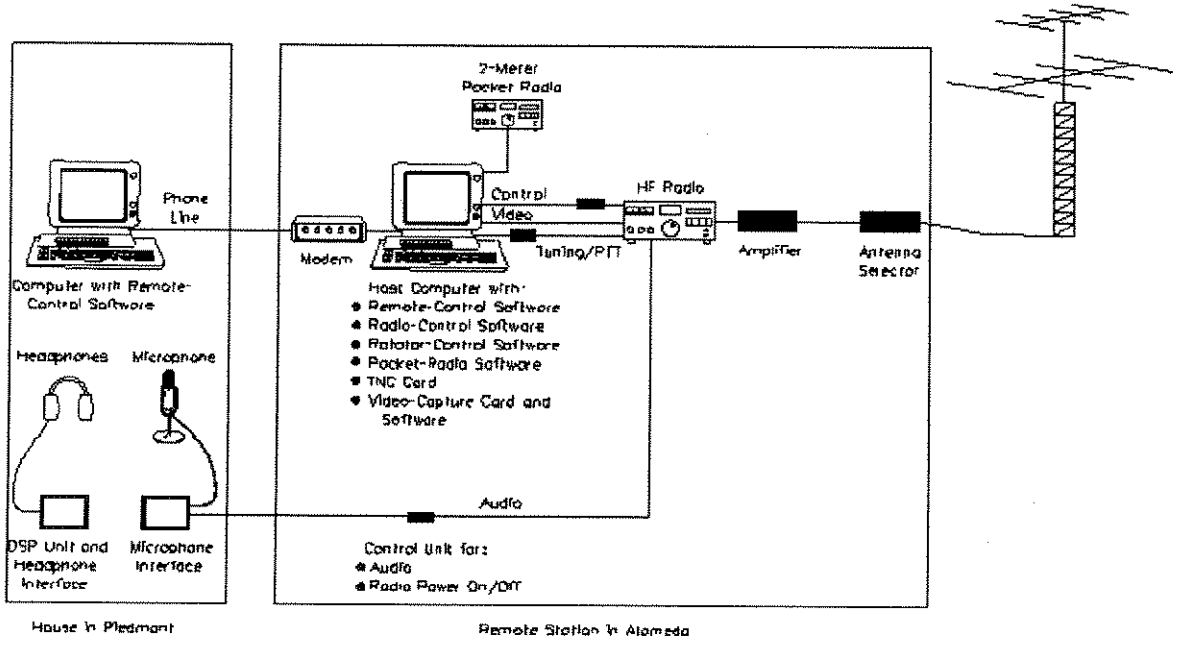
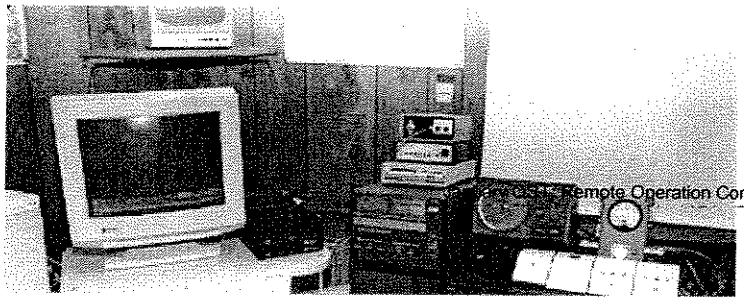


Figure 1—Block diagram of KD6UO's remotely controlled HF station.



At the heart of the remote station is an ICOM IC-781 transceiver along with associated interface modules, rotator control, AEA HamLink and more. The station computer is a 486-based PC with 16 MB of RAM running *Windows 3.1*.

Audio

Although audio signals can be digitized and sent over the same connection as computer data, most hams won't have access to the high-bandwidth communication links necessary to make this feasible. So for now, your remotely controlled amateur station will probably need a separate telephone line (or a radio frequency link) for audio.

At KD6UO's Alameda station, an AEA HamLink unit connects one of the telephone lines to the IC-781. When Roger dials that phone number, the HamLink answers the phone. After Roger punches in a password number using his phone handset, the HamLink turns on the radio, establishing the audio link.

Getting the audio to the remote site, however, is only half the battle, because amateur transceivers typically don't provide access to all of their audio adjustments through their computer ports. The list of controllable features varies from manufacturer to manufacturer, but you may find that you won't have remote access to notch filters, noise blankers, and gain controls.

To overcome these limitations, Don Melcher installed a DSP-9+ unit from Timewave Technology at the house end of the audio link. The DSP-9+ acts as a notch filter and noise blanker, and also has a headphone jack and gain control.

Between the phone line and the DSP-9+ is an AEA CW Link box. Although its name may suggest that the unit only supports CW operation, its *raison d'être* in the KD6UO setup is its microphone jack. Having a direct connection from the microphone to the telephone line eliminates the need to talk over a speakerphone or to hold a regular telephone handset when operating.

Antennas and Antenna Control

KD6UO's remote station has only one tower, but it holds a collection of antennas that most hams would envy. The same principles used to control his antennas can, of course, be applied to much simpler installations.

Like the IC-4KL amplifier, the ICOM EX-627 antenna selector switches automatically when the attached radio is changed to a different band. Such an accessory makes it easy to create a versatile remote station with multiple antennas.

A Yaesu G-2700SDX rotor takes care of pointing KD6UO's beam antennas properly. It's controlled by a simple terminal program that comes with the Windows operating system. Don Melcher has configured the program with on-screen buttons that the user can click on to point the beams toward a given continent quickly. For more precise pointing, an exact heading can be typed in. (Although *CT* can control a rotor to turn an antenna to a certain heading, it can't respond to queries about where the antenna is currently pointed, a capability that Roger wanted.)

For a somewhat simpler installation, you could use multiple nondirectional antennas and switch among them, either with an automated antenna selector or with appropriate software (*CT*, for example, can do such switching). Of course, you could also eliminate the need for switching antennas entirely by using a single multiband antenna. This would be an excellent way to get started with remote-control hamming.

At the time this is being written, KD6UO's tower has the following antennas:

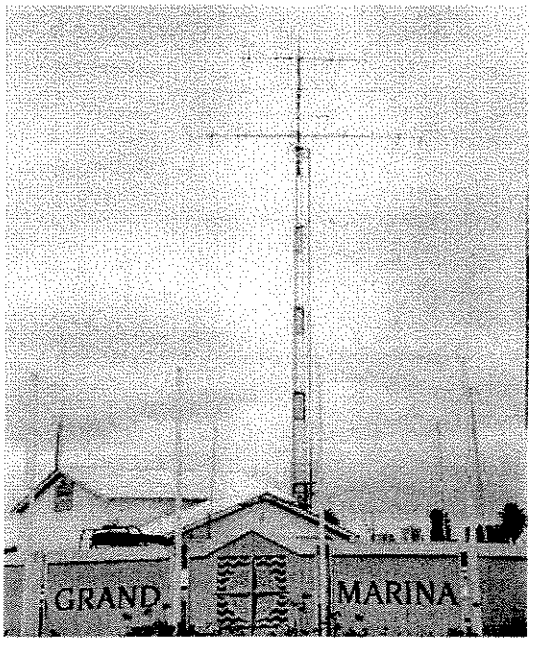
- A triband vertical for 146 MHz, 440 MHz, and 1.2 GHz
- A four-element Yagi for 10 and 12 meters and a four-element Yagi for 15 and 17 meters, both on the same boom
- A rotatable dipole for 75 and 80 meters
- A two-element Yagi for 30 meters
- A six-element Yagi for 20 meters and a three-element Yagi for 40 meters, both on the same boom
- Two inverted Vs for 75 and 80 meters (at right angles to each other)
- Two inverted Vs for 40 meters (at right angles to each other)
- The tower is shunt fed for 160 meters

(All of the Yagis and the rotatable dipole are made by Force 12, the UHF/VHF multiband vertical is a Diamond, and the inverted Vs and the 160-meter omega match are homebrew.)

The tower itself (from U.S. Tower) is 85 feet high, not counting a 24-foot mast on top that actually holds most of the antennas. Twenty-two ground rods were incorporated into the 15 cubic yards of concrete when the tower was installed.

Each antenna has its own feed line, allowing for maximum flexibility in combining antennas for various situations. A Dunestar StackMatcher mounted next to the tower lets the operator feed any combination of 40-meter or 75/80-meter antennas to the radio. For example, during the evening portion of a stateside contest such as the ARRL November Sweepstakes, the 40-meter Yagi and both 40-meter inverted Vs could be used simultaneously for essentially nondirectional coverage.

Selecting the right coaxial cable for a remotely controlled station is crucial because interference to the telephone lines (or radio links, if that's what you're using) could render the station inoperable. KD6UO's station uses RG-214, which has double-layer, silver-plated shielding and a silver-plated center conductor. The 10/12-meter and VHF/UHF antennas use LMR-600 low-loss coax.



The remote HF station site at Grand Marina in Alameda, California. The tower is 85 feet tall and supports nine antennas (some are not visible in this photograph). The tower is also shunt fed for 160 meters.

Computers

Computers are the heart of a remotely controlled station, unless you're willing to settle for the lesser capabilities provided by tone-control remote systems. The KD6UO installation demonstrates a typical way to use computers for remote control. The computer at the station does the actual work of controlling the radio, rotor, and other electronic and mechanical devices. The

computer at Roger's home mimics the one at the station; its screen displays the contents of the station computer's screen and its keyboard and mouse act as a remote keyboard and mouse for the station computer.

ReachOut software (from Ocean Isle Software) is used on both computers to provide this capability. *ReachOut* is a general-purpose program for controlling another computer remotely over a telephone line or a computer network. As do similar programs, such as *PC Anywhere* and *Timbuktu*, it basically extends the monitor, keyboard, and mouse of the host computer to the remote computer. It also permits file transfers, a handy capability for updating software or for downloading logs from the station to your house after a contest.

The station computer is a 486-based IBM clone with 16 MB of RAM running *Windows*. (Version 9 of *CT* requires at least a 386-based system.) Other multitasking software could be used instead of *Windows* to run the different programs needed to control everything; that might reduce the RAM requirements. Or, of course, a Macintosh computer would not require separate multitasking software.

This computer has seven communications ports, used for the following:

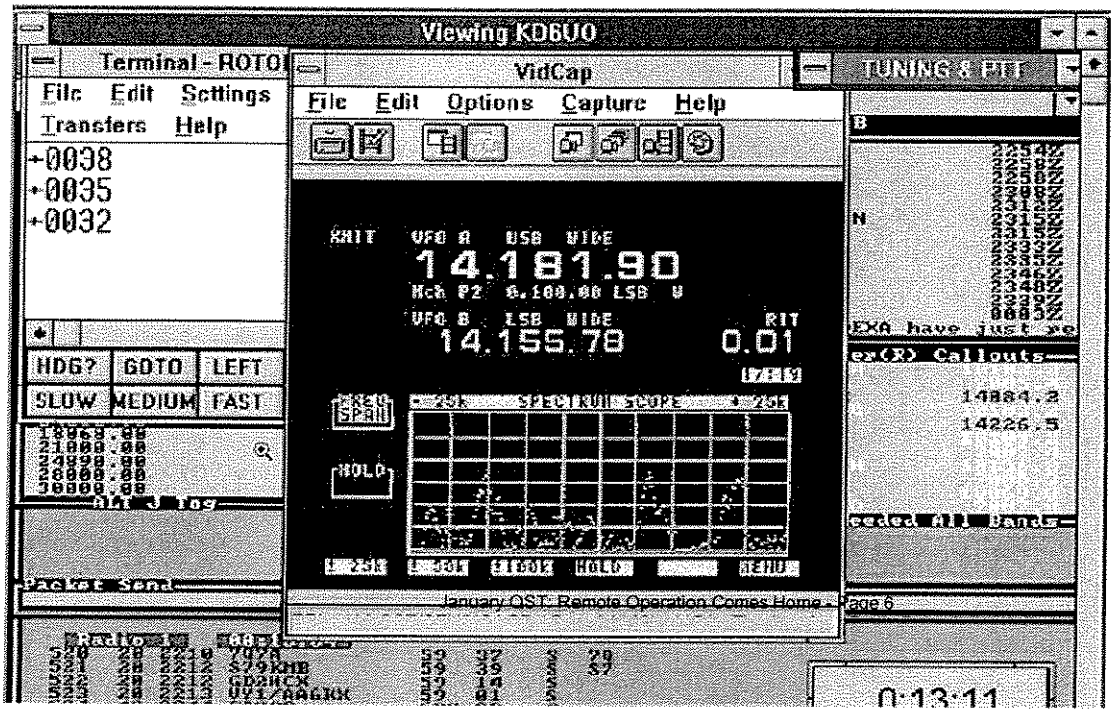
- Radio 1 (the main IC-781)
- Radio 2 (another IC-781)
- Rotor control
- Mouse
- Modem
- Kantronics KAM Plus (for HF packet and RTTY)
- *CT* network for multiradio contesting

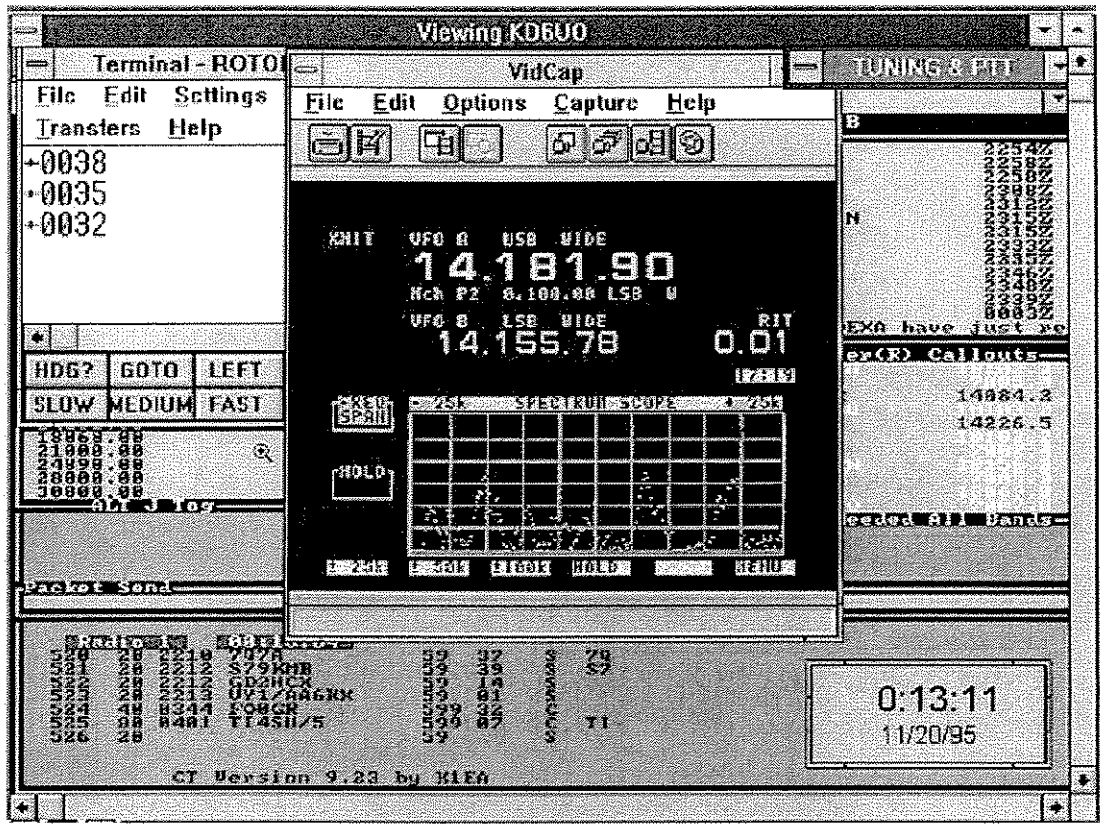
The computer's three printer ports are used for:

- Up/down tuning and PTT (connected to the microphone jack on the IC-781; on some radios these functions can be controlled through the computer port, eliminating the need for a separate connection)
- The CW keyboard function of *CT*
- Printer

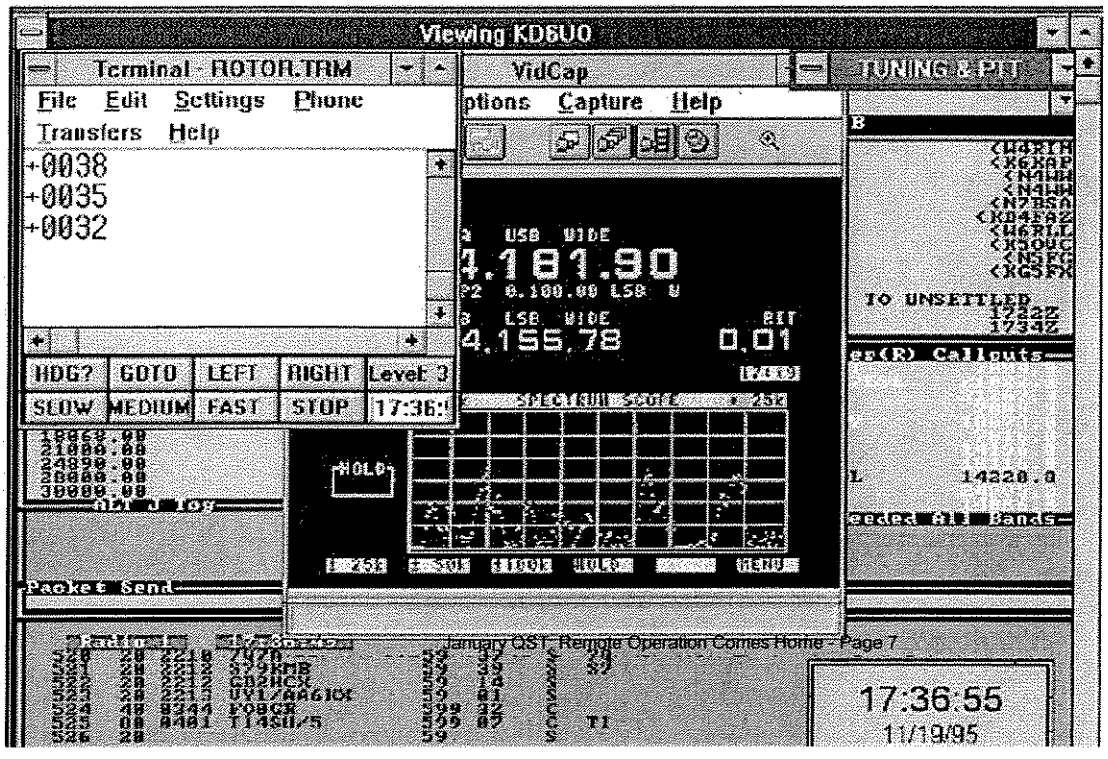
This computer also has an internal TNC board made by DRSI (connected to the Alinco DR-1200 data radio), and a Media Vision Pro MovieStudio video capture card. The video card receives the incoming video signal from the IC-781's display screen, digitizes it, and displays it (through *VidCap* software) on the computer's screen.

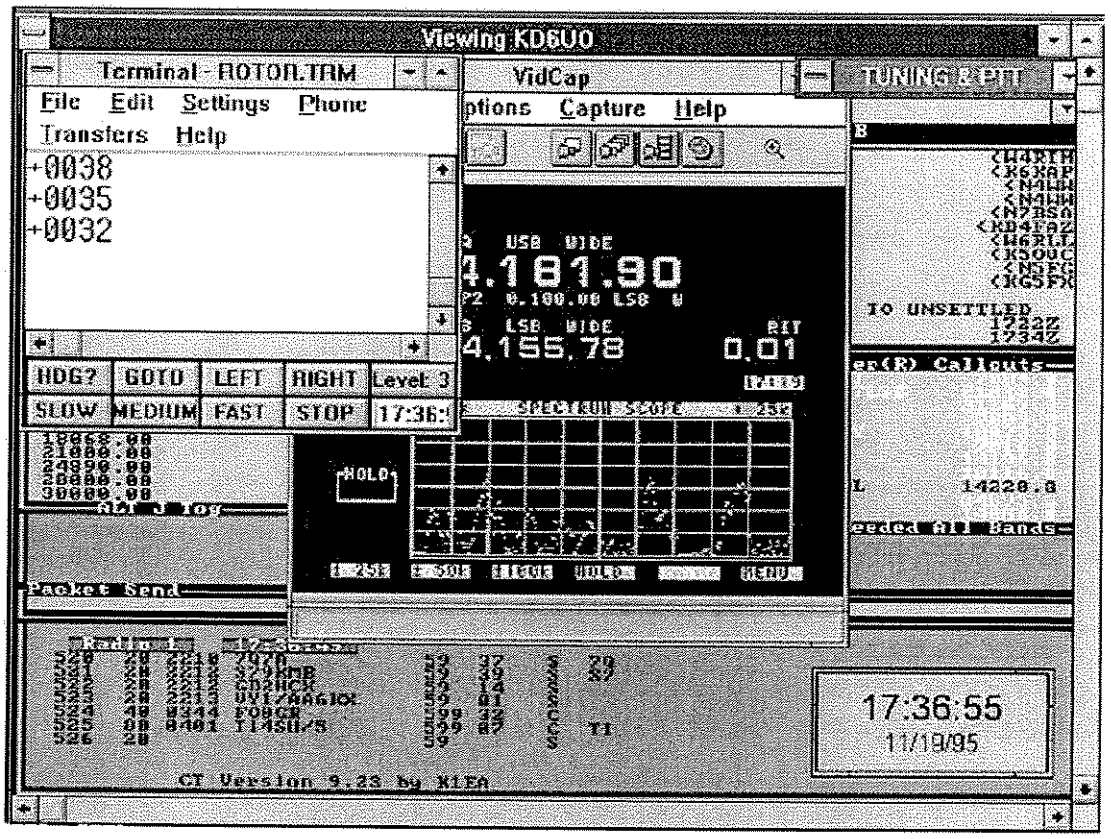
At his house, Roger has a Pentium computer with 16 MB of RAM running *Windows*. Again, other control programs might not require *Windows* or quite so much RAM.





With a click of a mouse button, Roger can see the main tuning display on the IC-781 transceiver. The screen shows the VFO A and B frequencies, the current operating mode, and the IC-781's "spectrum scope." (*courtesy Don Melcher, N6IPE*)





Another mouse click brings up the rotator control window (upper left corner). Roger can type in an exact heading, or use shortcut keys which point the antennas toward specific continents. (*courtesy Don Melcher, N6IPE*)

Control Link

A vital aspect of the KD6UO setup is the use of general-purpose computers communicating over telephone lines to control the remote station. Although several companies offer tone-activated control units for Amateur Radio, Don Melcher notes that this approach is not suitable for fast-paced activities such as contesting or DXing. In these cases, you need the speed and accuracy (clicking on a clearly labeled on-screen button instead of trying to remember the right tone sequence) offered by computers.

Don considers 9600 bauds to be the minimum link speed for this type of setup, although if you're willing to endure slow response times, you could go lower. KD6UO's station uses 14.4 kbauds.

Both the Alameda station and Roger's house have two telephone lines dedicated to remote operation—one for control data and one for audio. Roger is considering the installation of ISDN lines at both locations. ISDN, which is now available in many parts of the United States, supports data rates of up to 112 kbauds over two channels simultaneously. This would provide faster performance for data-intensive remote operations, such as displaying the video panel of the IC-781.

Miscellaneous Equipment

Other components of the KD6UO system include the following:

• Lightning and surge protection (ground rods at the tower and equipment from Polyphaser in the shack)

• Dunestar 600 band-pass filters between the transceivers and the amplifiers

• A Kenwood TS-50S HF transceiver at Roger's house so that he can monitor the output of his remote station, as required by FCC rules.

• A TNC and packet software at Roger's house so that he can check DX *Packet-Cluster* information without bringing up the remote site.

Let's Go Remote!

Although KD6UO's station may have more bells and whistles than *you* might need, it demonstrates how much off-the-shelf hardware and software is available today for remote control of amateur radios. If remote control seems like a feasible solution for your radio situation, this is a good time to start researching the subject seriously.

Here are some things to think about:

• What will the station be used for? Ragchewing has much less demanding requirements than contesting or working DXpeditions. However you design the station, be willing to realize its limitations; Roger still drives to Alameda to operate his station locally for his more serious contest efforts.

• Do you want to use telephone lines, radio links, or a combination of both? Tone control can be accomplished over a radio link, which is handy if your club already has a VHF or UHF frequency available for this purpose. Computer control is faster and more versatile, but is easier to implement over a telephone line. In either case, of course, you'll need a separate frequency or phone line for the audio.

Some hams have created remote setups that use a phone line for control and a radio link for audio; this could be an easy way to get started if your club already has a spare frequency and a phone line installed at the club shack.

• What resources do you already have available? Do you have a recent-model HF radio with functions controllable through a computer interface? Does your club have a station with good antennas? Are there club members with expertise in computer software and/or hardware? You may be surprised at how much of a head start you have toward creating a remote station.

• How can you minimize equipment cost and operating expenses? Are you willing to start with a very basic station and later upgrade it, bit by bit? Can you find a site for a remote station within your local calling area to minimize the phone bills?

• What can you do to ensure that the station operates reliably and safely? A remote station should be built to the most stringent construction standards you can afford. Good coax, filters, and the like will keep the control units from interfering with the radio signals, and vice versa. Carefully designed lightning protection is essential for a station that will be unattended most of the time.

I'll close with a personal note. While I was researching this article, I had a chance to operate KD6UO's station myself. It was easy to learn how to run everything, and I quickly took the opportunity to respond to a CQ from a school in Florida. During our conversation, I mentioned that I was at someone's home controlling a transmitter and antennas some miles away. As soon as I finished the QSO, I found myself the object of a mini-pileup of people wanting to know more about the station.

Setting up a remotely controlled station isn't quite at the plug-and-play stage yet; it still requires careful planning, some flexibility in your goals, and good old-fashioned ham ingenuity. But I can almost guarantee that you'll have a lot of fun operating the station and talking about it with the people you meet on the air!

Patty Winter, PO Box 537, Menlo Park, CA 94026, is a freelance writer in the San Francisco Bay area. She primarily writes marketing materials for local high-tech companies, but occasionally does magazine articles on astronomy, the space shuttle, travel, and Amateur Radio. The holder of an Advanced class license, her Amateur Radio interests include DXing, SAREX, and TCP/IP packet radio.